



Russian Minefield Tactics Pose Challenge to Mobility

by Richard L. Garcia & Colin Colley, TRADOC G-2 Analysts

The Russian Army is laying minefields that are significantly larger and, therefore, more challenging to breach than what has been seen in Ukraine since Russia invaded Crimea and the Donbas in 2014. Since the wider Russian invasion of Ukraine in 2022, Ukraine has surpassed Afghanistan and Syria to become the most heavily mined country on earth. Landmines have been identified in 11 of Ukraine's 27 regions—Chernihivska, Dnipropetrovska, Donetsk, Kharkivska, Khersonska, Kyivska, Luhanska, Mykolaivska, Odeska, Sumska, and Zaporizka. Ukrainian armed forces, separatist groups, and the Russian Army have used landmines extensively as tactical weapons, exploiting their ability to disrupt enemy movements, halt penetrations, and inflict casualties.



Figure 1: Mined regions in Ukraine - created by TRADOC G-2



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Over the winter of 2022-23, Russian forces increased the amount and depth of their defensive positions—including minefields—while the Ukrainians prepared to go on the offensive. Russian doctrine emphasizes attrition of enemy forces rather than mobility, and landmines are a vital component. Russian forces initially followed their doctrine and created minefields with a width and depth of 100-200 meters. However, over time, Russian forces have expanded the size of minefields to 500 meters or more and, in some cases, have increased their density. Most of these more extensive minefields are located along the principal axes of advance.

Russia produces antipersonnel and antivehicle mines, including new designs not seen in other conflicts, such as the PTM-4M and POM-3. Human Rights Watch has discovered at least 13 types of antipersonnel mines and 13 types of antivehicle mines (see Appendices for details on specific mine variants). In the Ukraine war, Russia has used only domestically produced mines, resulting in shortages likely due to insufficient manufacturing capacity to keep up with demand. To overcome this challenge, the Russian Army has resorted to creating irregularly shaped minefields, increasing the distance between mines, mixing in fake mines with live AT mines, and creating dummy minefields.

Russian mines have created a significant challenge for Ukrainian forces, many of which have limited breaching capabilities. Several NATO countries have donated additional breaching systems to Ukraine. Even with these breaching assets, a 500-meter minefield would take approximately 1.5 hours or more to breach. Additionally, most of these minefields are combined with other obstacles like tank ditches and dragon teeth, making the operation even more challenging and time-consuming. The persistent drone surveillance makes Ukrainian breaching elements vulnerable to detection and Russian artillery fire. Ukraine's inability to breach Russian minefields stalled their 2023 counteroffensive. In three months, the Ukrainians only advanced approximately 16 kilometers along their three main axes of advance.

The Russian Army has learned that with enough mines—or even the threat of significant mines—a Ukrainian assault can be slowed or even halted by defeating their breaching operations. To overcome this challenge, the Ukrainian Army must modify its mine-clearing and breaching solution. For example, a better counter-UAS capability could provide Ukrainian forces more time to breach by disrupting Russian surveillance drones. However, the longer it takes the Ukrainian Army to develop an effective breaching strategy, the more time it gives the Russian Army to improve its defensive positions.

IMPLICATIONS FOR THE U.S. ARMY

As minefields and other obstacles become more advanced, U.S. Army maneuver units could emphasize training on breaching deep obstacles, targeting enemy engineer assets, and the OPFOR could simulate Russian obstacle tactics.

- Russian operations in Ukraine emphasize attrition of enemy forces rather than mobility. Landmines are one method that forces mobility-focused armies into an attrition fight, suggesting U.S. Army units may benefit from placing greater emphasis on training for breaching deep obstacles under constant observation and heavy indirect fire.
- Preventing large-scale minefield emplacement requires targeting mine-laying equipment and units to disrupt these obstacles before they are placed. In training exercises, targeting engineer assets could reduce the enemy's minelaying and obstacle construction capability. Reducing enemy engineer assets will support rapid maneuver and lessen the need to breach deep minefields covered by observation and fires.

OPFOR could adopt tactics similar to Russia's minelaying and obstacle tactics. Given that mobility is a strength of U.S. ground forces, the OPFOR could create obstacle belts that force the blue force to overcome countermobility obstacles, including deep minefields supported by persistent drone surveillance and artillery.



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**APPENDIX 1: RUSSIAN ANTIPERSONNEL LANDMINES
 USED IN UKRAINE SINCE 24 FEBRUARY 2022**

NAME	TYPE	ORIGIN	INITIATION	NOTES
MOB	Fragmentation	Russia	Multiple Option	A modern hand-emplaced directional multipurpose mine can be deployed either command-detonated or victim-activated. The Mine Ban Treaty prohibits mines used in victim-activated mode with a mechanical pull, tension release, or seismic fuse. This mine is only used by Russia.
MON-50	Fragmentation	USSR/ Russia	Tripwire/Command	The MON series of hand-emplaced directional multipurpose antipersonnel mines can be command-detonated or victim-activated. The Mine Ban Treaty prohibits use in victim-activated mode with a mechanical pull, tension release, or seismic fuse.
MON-90	Fragmentation	USSR/ Russia	Tripwire/Command	
MON-100	Fragmentation	USSR/ Russia	Tripwire/Command	
MON-200	Fragmentation	USSR/ Russia	Tripwire/Command	
OZM-72	Fragmentation	USSR/ Russia	Tripwire/Command	A multipurpose bounding munition emplaced either in a command-detonated or victim-activated manner. When used in victim-activated mode with a mechanical pull, tension release, or seismic fuse, they are prohibited by the Mine Ban Treaty.
PFM-1/PFM-1S	Blast	Russia	Pressure/SD	Uniquely shaped and constructed, this plastic-cased mine can be scattered by mine-laying rockets and dispensers mounted on trucks or helicopters. It contains 37 grams of a liquid high explosive. Both Russia and Ukraine stockpile this type.
PMN-2	Blast	USSR/ Russia	Pressure	A circular, plastic-cased mine. Ukraine destroyed its stockpile of this type in 2003.
PMN-4	Blast	Russia	Pressure	A modern circular, plastic-cased mine was produced by Russia. First publicly displayed by Russia in 1993, it has never been stockpiled by Ukraine.

NAME	TYPE	ORIGIN	INITIATION	NOTES
POM-2/POM2R	Fragmentation	USSR/ Russia	Tripwire/SD	A metal-case bounding mine delivered by helicopter, ground-fired rockets, or other means. Russia stockpiles POM-2 and POM-2R mines, while Ukraine destroyed its stocks of this mine in 2018.
POM-3	Fragmentation	Russia	Seismic	Used only by Russia, POM-3 mines were first publicly displayed during annual military exercises in 2021. The POM-3 is scattered by rockets or truck-mounted launchers. Ukraine does not possess the POM-3 mine or its delivery system. Markings on an expended delivery canister pictured with POM-3 mines that failed to deploy properly indicate it was produced in 2021.

Table 1: Mine data from Human Rights Watch

APPENDIX 2: RUSSIAN ANTIVEHICLE LANDMINES USED IN UKRAINE SINCE 24 FEBRUARY 2022

NAME	TYPE	ORIGIN	INITIATION	NOTES
PKTM-1R	Shaped Charge/Top-Attack	Russia	Seismic Sensor	Produced and used only by Russia, the mine cannister is hand-emplaced and its sensors detect the seismic and thermal signatures of vehicles to distances of 200-300 meters. Once a target is detected, a sensor-fused submunition is ejected into the air and scans for a target. Once a target is located a shaped charge is fired downwards onto the top of the target.
PTM-1/PTM-1G	Blast	USSR/Russia	Pressure/SD	A plastic-bodied, rectangular mine scattered by helicopter or rocket artillery (Grad/Uragan). Both Russia and Ukraine stockpile this type of mine.
PTM-3	Shaped-Charge	USSR/Russia	Magnetic Influence/SD	Rectangular, metal-cased mine scattered from individual tubes or truck-mounted, helicopter, and rocket dispensers. Only Russia stockpiles this type of mine.
PTM-4M	Shaped-Charge	Russia	Magnetic Influence/SD	Modern metal-cased, rectangular mines scattered from individual tube or truck, helicopter, and rocket-mounted dispensers. This mine has not been documented previously and the marking on the dispenser indicates production in 2021.

NAME	TYPE	ORIGIN	INITIATION	NOTES
TM-62M	Blast	USSR/Russia	Pressure	Large, metal-cased circular mine that is either hand-emplaced or mechanically laid. In addition to the commonly seen MVCh-62 pressure fuse, it is compatible with many other types of fuses. Both Russia and Ukraine possess this type.
TM-62P3	Blast	USSR/Russia	Pressure	Large, plastic-cased circular mine that is either hand-emplaced or mechanically laid. In addition to the commonly seen MVCh-62 pressure fuse, it is compatible with many other types of fuses. Both Russia and Ukraine possess this type.
TM-83	Shaped-Charge	USSR/Russia	Seismic/Infrared Sensor	Emplaced above the ground, both Russia and Ukraine possess this cylindrical metal-cased mine.

Table 2: Mine data from Human Rights Watch



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